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9. A messaging mechanism for inter-processor communication comprising:
a shared service processor providing a single point of contact for a user interfacing with at least one line processor, the shared processor in electrical communication with shared memory including mailboxes operable to enable communication between the at least one line processor and the service processor; wherein

the service processor is operable to selectively deliver commands to a respective mailbox of a selected one of said at least one line processor, [and]

the service processor is selectively operable to issue a system management interrupt to any or all of the at least one line processors, the interrupt signal[l]ing to the at least one line processor to access a respective mailbox in the shared memory[.];

the at least one line processor operable to selectively deliver commands to mailboxes, wherein the commands delivered to the mailboxes by the at least one line processor are consolidated by the service processor to reduce the number of accesses to a backplane to which the service processor and the at least one line processor are coupled.

Remarks

Claims 1, 2, and 5 - 8 have been amended. Claim 9 has been added. Claims 1-9 are pending in this Application. Reconsideration and re-examination of this application is respectfully requested in view of the following remarks.

Claim Objections

Claims 1 – 5 and 7 were objected to under 37 C.F.R. 1.75(a) for failing to particularly point out and distinctly claim the subject matter of the invention. Claims 1, 2, and 5 – 8 have been amended in order to correct typographical errors. Claim 1 has been amended to refer to a "service processor" as opposed to a "shared processor", thus providing antecedent basis. The Applicant has incorporated the Examiner's suggestion regarding claim 1 so that claim 1 now recites that "the service processor is selectively operable". Claim 2 has been amended to recite:

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> "The messaging mechanism of claim 1, wherein the line processor
> receiving the system management interrupt will access the command
> delivered to [a] the respective mailbox, interpret the command and deliver
> [the] an appropriate response to [the] a mailbox."

It is thus clarified that the line processor will access the respective mailbox to which the command was written, but the line processor may deliver an appropriate response to "a mailbox" – which may be a different mailbox that the "respective mailbox" to which the command was written.

In Claim 3, "the mailbox" refers to the mailbox to which the response was delivered. Claim 5 has been amended to refer to "a backplane to which the service processor and the at least one line processor are coupled."

Claim 6 has been amended to recite the step of "providing mailboxes for each of the at least one line processors [at] and the shared processor". The inclusion of the original word "at" was a typographical error.

Claim 7 has been amended in a similar manner as claim 2. Claim 8 has been amended to delete a step redundant to a step recited in claim 7.

Claim Rejections – 35 U.S.C. § 103

Claims 1 – 3 and 5 – 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kedem, U.S. Patent No. 6,167,485 ("Kedem"), in view of van der Wal, "Efficient Interprocessor Communication in a Tightly-coupled Homogeneous Multiprocessor System". This rejection is respectfully traversed.

Claim 1 recites :

"A messaging mechanism for inter-processor communication comprising:

> a shared service processor providing a single point of contact for a user
> interfacing with at least one line processor, the service processor in
> electrical communication with shared memory including mailboxes
> operable to enable communication between the at least one line processor
> and the service processor; wherein
> the service processor is operable to selectively deliver commands to a
> respective mailbox of a selected one of said at least one line processor, and
> the service processor is selectively operable to issue a system
> management interrupt to any or all of the at least one line processors, the

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interrupt signaling to the at least one line processor to access a respective
mailbox in the shared memory."

In accordance with the claimed invention, the line processors are accessible to the
user only via the shared service processor. When the service processor needs to
communicate with a line processor, the service processor delivers commands to a
respective mailbox for the line processor, and issues a system management interrupt to
the line processor, signaling to the line processor to access the respective mailbox.

Kedem describes a storage system including disk adapters coupled to a cache that
has a mailbox area. Kedem states that "the mailbox area 44b may be used to facilitate
communications among the disk adapters 45a – 45d and with the host adapter 42." (Col.
10 lines 16-18.) Kedem separately describes a service processor that "may permit an
operator to use the service processor 47 for configuring the components of the storage
system 40 and for running or initiating diagnosis and maintenance facilities". (Col. 10
lines 26 – 28.)

However, as the Office Action points out, nowhere does Kedem describe how the
service processor communicates with the disk adapters. There is no suggestion in Kedem
of a service processor providing a single point of contact for a user interfacing with at
least one line processor, the service processor in electrical communication with shared
memory including mailboxes operable to enable communication between the at least one
line processor and the service processor, as the Applicant has claimed.

The Office Action contends that it would have been obvious to modify the system
of Kedem to use mailboxes in the shared cache memory to provide communication
between the service processor and the host and disk adapter processors. In support of this
assertion, the Office Action points out that Kedem teaches that the service processor can
be programmed to perform the data verification and repair process functions of the
primary disk adapter.

Kedem does suggest that the service processor may be programmed to perform
the data verification and repair process – but this is suggested as an alternative to using
one of the disk adapters to perform the process. (Col. 12 lines 15 – 21.) It is stated in
Kedem that a disk adapter is preferably used (Col. 12 line 18), and it is explicitly stated in
Kedem, as shown above, that the disk adapter processors are capable of communicating

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via the mailboxes in the shared cache memory. Kedem does not address how the data verification process would be performed if the service processor were instead used to initiate it. There is no suggestion in Kedem of the claimed service processor providing a single point of contact for a user interfacing with at least one line processor, the service processor in electrical communication with shared memory including mailboxes operable to enable communication between the at least one line processor and the service processor.

The Office Action contends, however, that one would modify Kedem such that the service processor would use mailboxes in the shared cache memory to provide communication between the service processor and the host and disk adapter processors because "using a common interprocessor communication scheme throughout the system would allow the system designer to reuse the existing code implementing mailboxes, thus reducing development costs". The Applicant respectfully disagrees.

There is no reason to conclude that modifying Kedem such that the service processor would use mailboxes to provide communication between the service processor and the host and disk adapter processors would allow a system designer to reuse existing code for implementing mailboxes thus reducing development costs, because it is equally likely that the mailbox code would require modification to support mailbox interaction between the service processor and the other processors, which might increase development costs. There is simply no reason to conclude that modifying Kedem in the suggested manner would be beneficial other than through hindsight in light of the Applicant's claimed invention. Since the Applicant's claimed invention cannot be considered in hindsight to motivate the modification of Kedem, the Applicant submits that Kedem does not teach or suggest the claimed "service processor providing a single point of contact for a user interfacing with at least one line processor, the service processor in electrical communication with shared memory including mailboxes operable to enable communication between the at least one line processor and the service processor".

The Office Action further asserts that van der Wal teaches a mailbox-based interprocessor communication system in which the sending processor generates an interrupt to attract the attention of the target processor after writing a message to a

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mailbox. However, van der Wal, like Kedem, fails to teach or suggest the claimed claimed "service processor providing a single point of contact for a user interfacing with at least one line processor, the service processor in electrical communication with shared memory including mailboxes operable to enable communication between the at least one line processor and the service processor". Combining van der Wal with Kedem adds no additional suggestion that such a service processor providing a single point of contact for a user interfacing with a line processor, the service processor in communication with shared memory including mailboxes for communicating with a line processor, should be provided.

Neither Kedem nor van der Wal, taken alone or in combination, teach or suggest the Applicant's invention as set forth in exemplary claim 1. The Applicant therefore respectfully requests that claim 1 be placed in condition for allowance. Claims 2, 3, and 5, dependent upon claim 1, should be allowable for the same reasons that claim 1 is allowable.

The Office Action rejected claim 4 under 35 U.S.C. 103(a) as being unpatentable over Kedem in view of van der Wal and further in view of Sato et al., U.S. Patent No. 5,133,071. This rejection is respectfully traversed. Neither Kedem nor van der Wal, taken alone or in combination, teach or suggest the steps of providing a shared processor serving as a single point of contact for a user interfacing with at least one line processor, and providing mailboxes for each of the at least one line processors and the shared processor enabling communication between the at least one line processor and the shared processor, as claimed in claim 4, dependent upon claim 1. Sato fails to provide any further such suggestion, taken alone or in combination with Kedem and van der Wal. The Applicant therefore respectfully requests that claim 4 be placed in condition for allowance.

Independent claim 6 should be allowable for the same reasons that claim 1 is allowable. In particular, as similarly described regarding claim 1, neither Kedem nor van der Wal, taken alone or in combination, teach or suggest the steps of providing a shared processor serving as a single point of contact for a user interfacing with at least one line processor, and providing mailboxes for each of the at least one line processors and the shared processor enabling communication between the at least one line processor and the

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shared processor. Claims 7 and 8, dependent upon claim 6, should be allowable for the same reasons that claim 6 is allowable.

Independent claim 9 has been added. Regarding dependent claim 5 and independent claim 9, there is claimed a messaging system which provides

> "... at least one line processor operable to selectively deliver commands to mailboxes, wherein the commands delivered to the mailboxes by the at least one line processor are consolidated by the service processor to reduce the number of accesses to a backplane to which the service processor and the at least one line processor are coupled."

Neither Kedem nor van der Wal, taken alone or in combination, teach or suggest the provision of a system wherein commands delivered to mailboxes by a line processor are consolidated by a service processor to reduce the number of accesses to a backplane.

The Office Action suggests that Kedem teaches, at Col. 11 lines 21 – 41, that a line processor selectively consolidates tasks onto the service processor to reduce the number of accesses to the backplane. The Applicant respectfully disagrees. At Col. 11 lines 33 – 41, Kedem states:

> "In addition, the checking redundancy groups may be initiated on observing heavy (or a particular amount of) activity for the particular redundancy groups to be scanned (particularly useful in cases where the chance of a data coherence problem increases with the amount of activity (e.g., writes) within the storage system)."

Here, Kedem describes the conditions under which redundancy groups might be checked. Kedem suggests that, under periods of heavy activity, coherence problems may increase and therefore the checking of redundancy groups should be initiated. This is entirely unrelated to the process undertaken during the checking of the redundancy groups. That is, regardless of when and why the checking of redundancy groups occurs, Kedem does not teach or suggest the provision of a messaging mechanism wherein commands delivered to mailboxes by a line processor are consolidated by a service processor to reduce the number of accesses to a backplane. Neither van der Wal nor Sato, taken alone or in combination with each other and Kedem, provide any further teaching or suggestion that such a messaging mechanism should be provided. The Applicant therefore respectfully requests that claims 5 and 9 be placed in condition for allowance.
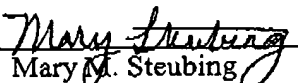
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Conclusion

Applicant asserts that the above claims are now in condition for allowance. An indication of such is respectfully requested.

In the event any extension of time for responding are required for the pending application, please treat this paper as a petition to extend the times required and charge deposit account number 05-0889 therefore.

Should further questions arise concerning this application, the Examiner is invited to call Applicant's attorney at the number listed below.

Respectfully Submitted,

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REPLACEMENT SHEETS

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